

FOODFOREST PROJECT

- DESIGN
- PROCESS PROPOSAL
- CONCEPTS
- CIRCULATION

- ANALYSIS SITE
- SOIL
- WIND
- SPREE
- SWOT
- TREES
- GEBIETSEIGEN PFLANZEN
- INFLUENCE POPULUS ON SITE
- SUN

BASICS FOODFOREST - MANAGEMENT

MOODBOARD



DESIGN

PROCESS PROPOSAL

PLAN

CONCEPTS

CIRCULATION

PROCESS PROPOSAL

PRIORITY :
FURTHER SOIL ANALYSIS .
+ EFFECT POLLUTED
GROUNDWATER
SOILANALYSIS :
SEVERAL POINTS IN THE
FOODFOREST + SEVERAL
DEPTHS

(coöperation with Humboldt univer-
sity or another institute ?)
I created a compact document with a
summary about our location and the
specifics of the build-up. This can be
used as an introduction of our project
& specifics of the site when looking
for partners.
(this doc is on google drive)

3 POSSIBLE RESULTS

1 acceptable levels of MKW/
PAK/heavy metals,...

replacement of Topsoil
recommended

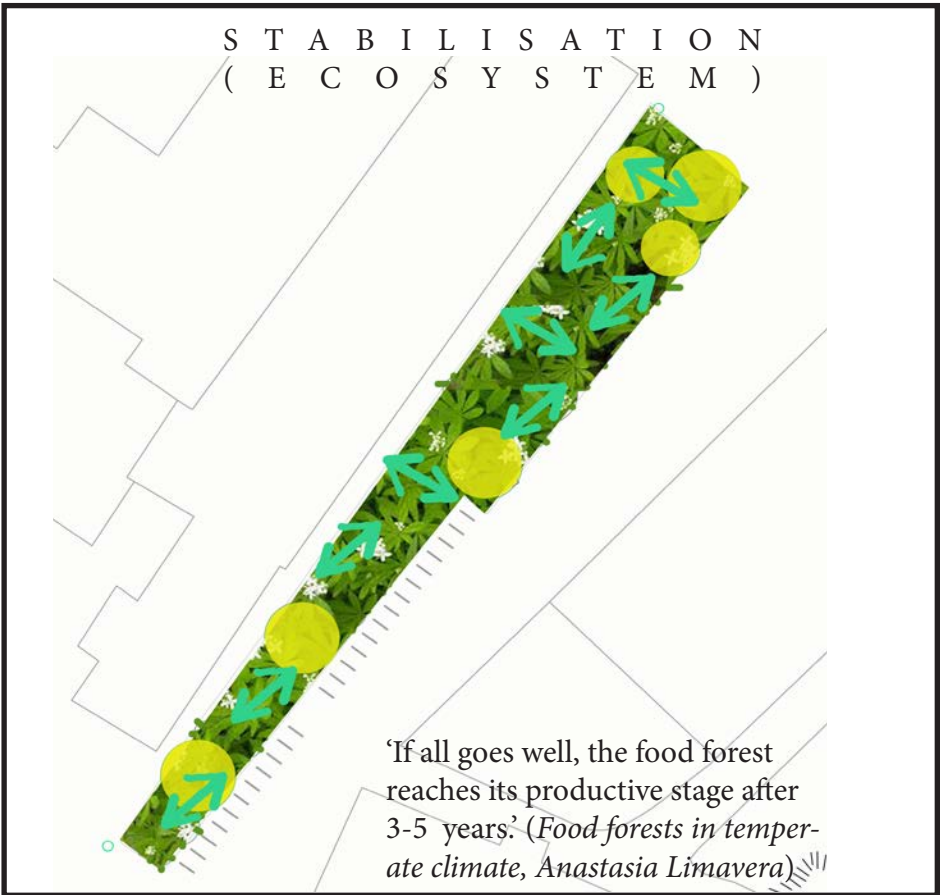
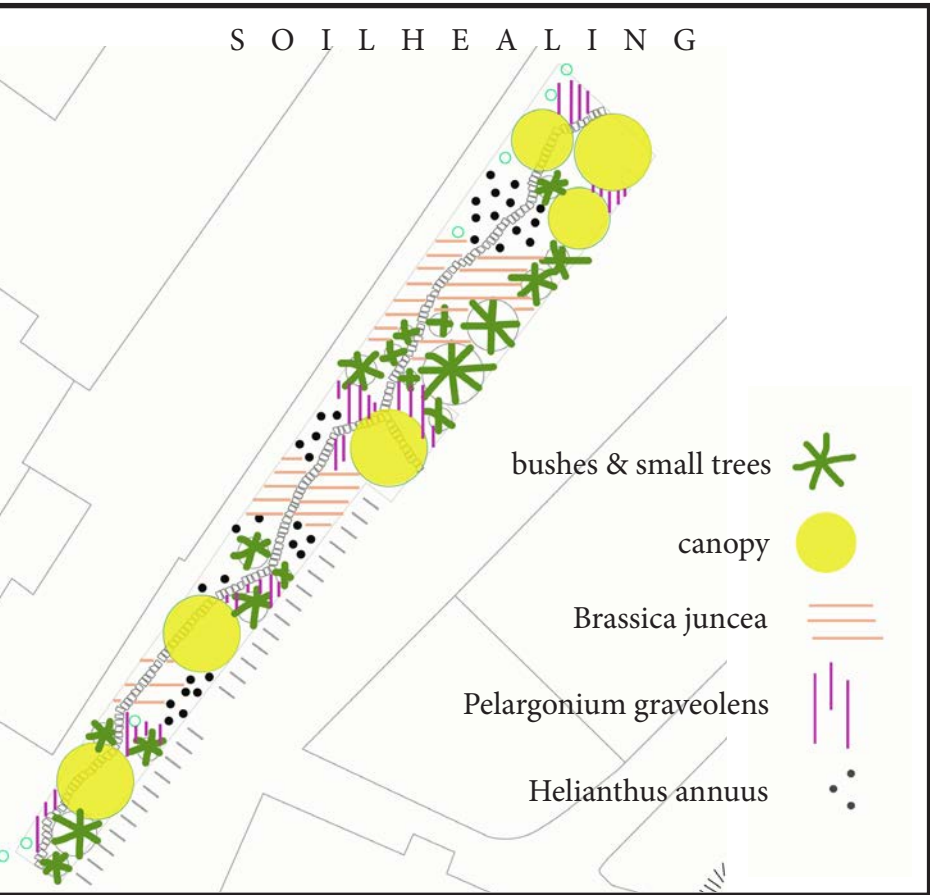
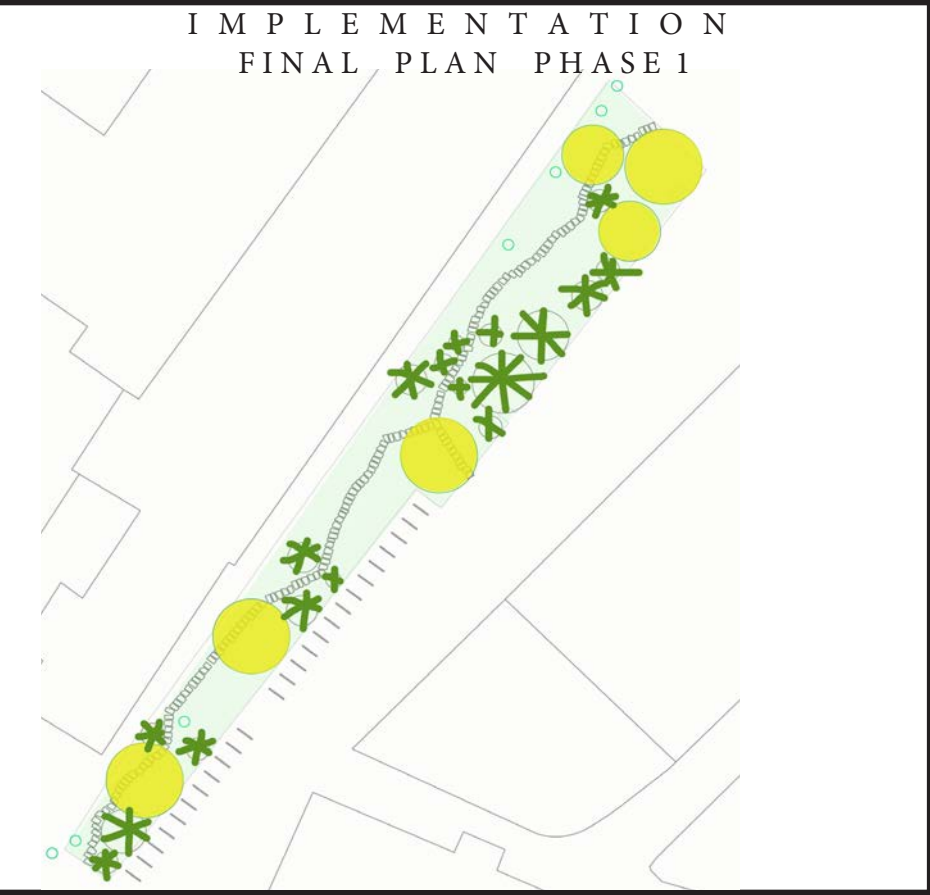
2 levels of MKW / PAK / heavy
metals not ideal, soil needs
healing first

3 unacceptable results

coöperation with specialists
- Phytoremediation not suf-
ficient?
- Mycore mediation?
- combination of both?
- other methods

- replacement of soil (deep)
- edible food in benches

“It is advised not to try to get all the layers in a food forest at once. It is smarter to plan so that each plant can have enough light and space to develop and start first with astablishing three layers: namely canopy, understory, and herbaceous layer.” (Food forests in temperate climate, Anastasia Limavera)



PLAN

subcanopy & canopy



plan of the big trees, smaller trees and shrubs
final plan phase 1

Brassica juncea



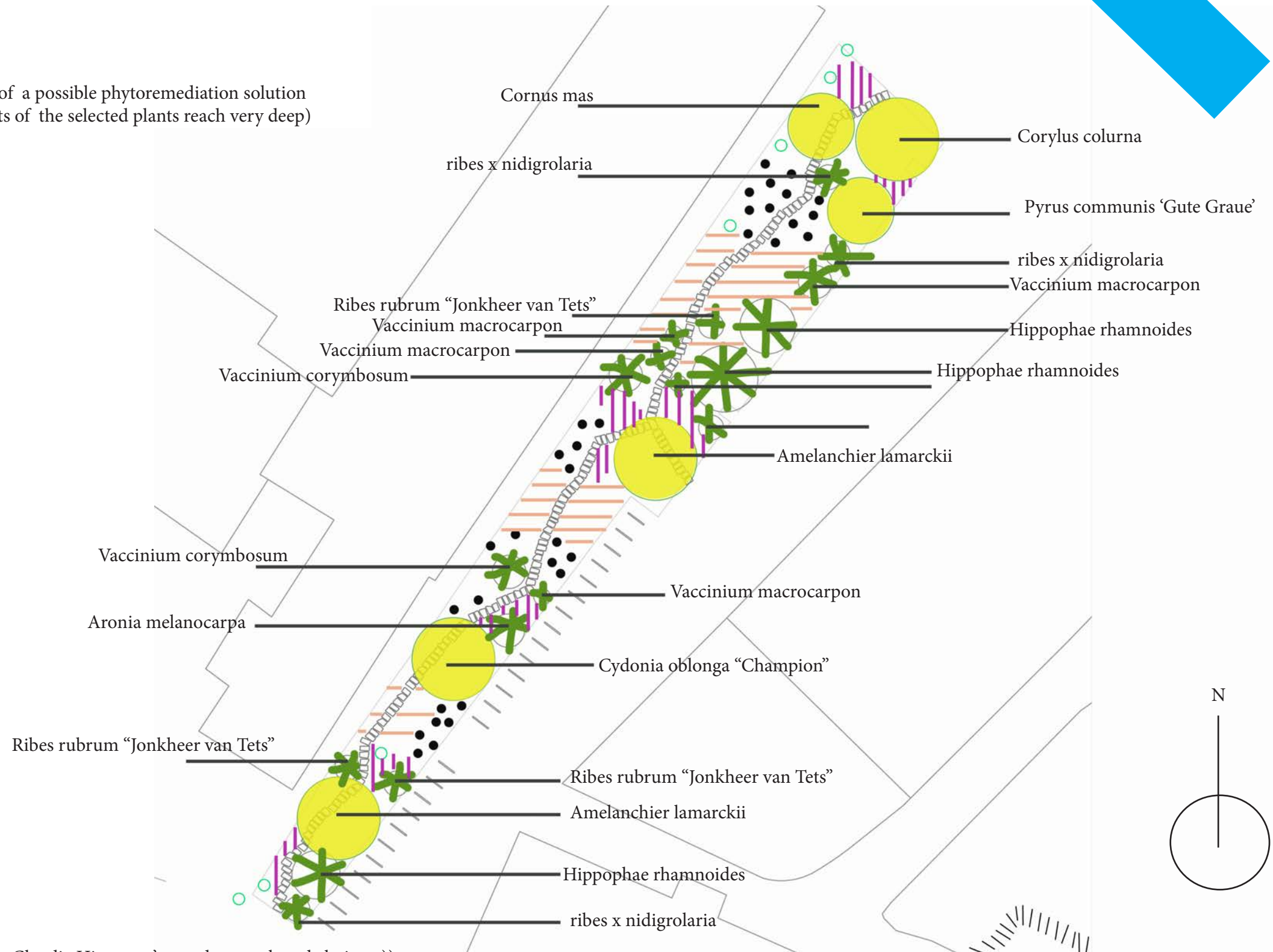
Pelargonium graveolens



Helianthus annuus



plan of a possible phytoremediation solution
(roots of the selected plants reach very deep)



(Trees and shrubs in this plan are partly based on Claudia Hirtmann's good research and choices :))

CONCEPTS



U- shaped canopy
south-faced
- catches the sun
- catches organic
matter

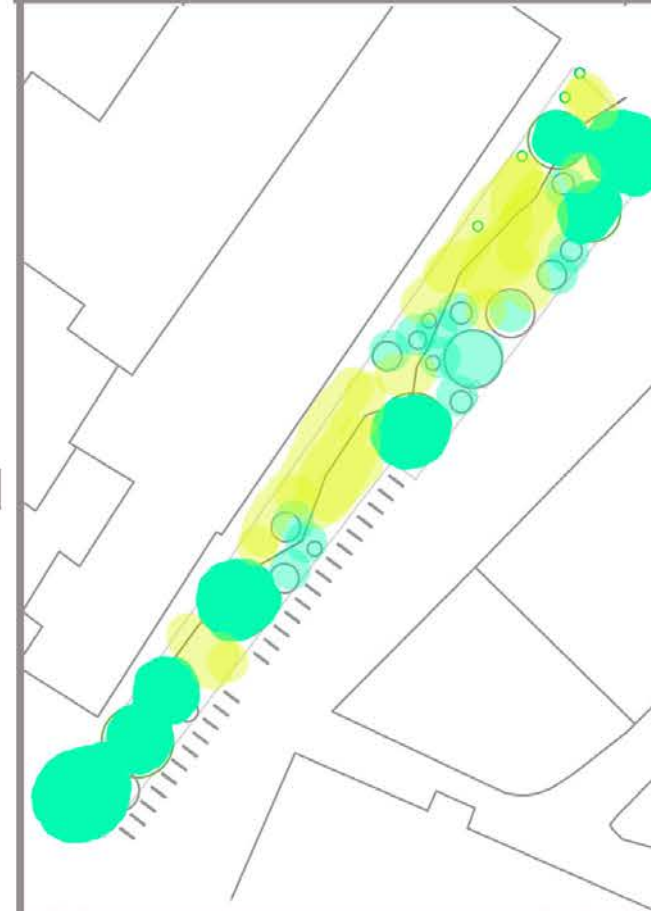
wind-breakers



protected areas
that work like
microclimates :
protected from wind
+ able to soak up
the sun



using the existing trees
as canopy layer, an
important
part of the foodforest-
ecosystem



planting in phases
-not all layers immedietely
-building up a
mini-ecosystem
takes time & patience

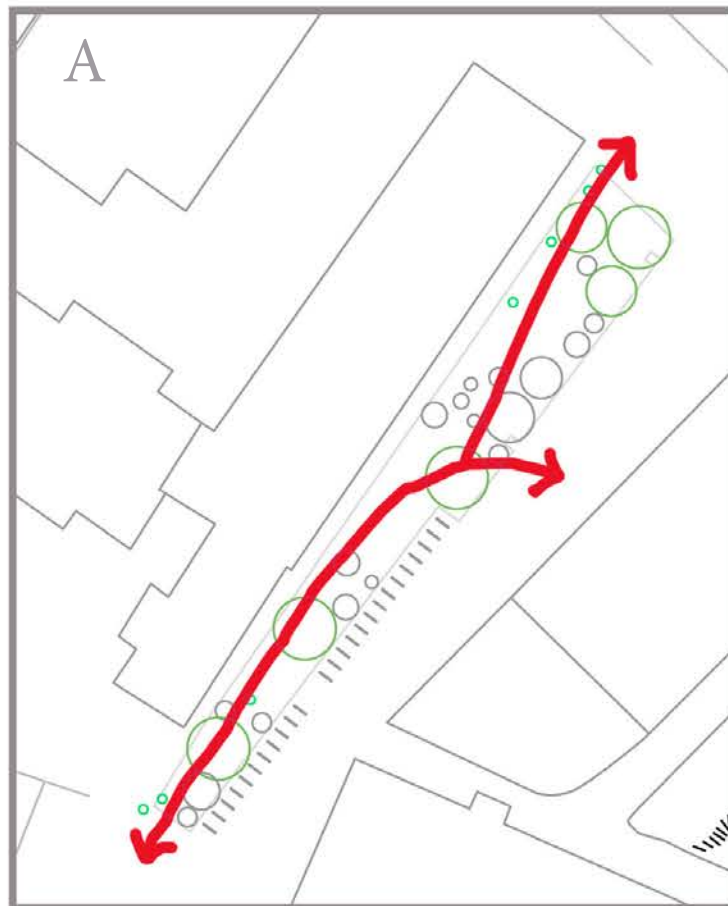
CIRCULATION

Out of all circulations I experimented with , these are in my opinion the four with the most potential. I choose A in the plan (the option that makes the acessibility of the FF high), but B, C and D are also to be considered. B, C and D have a lot of ecological potential.

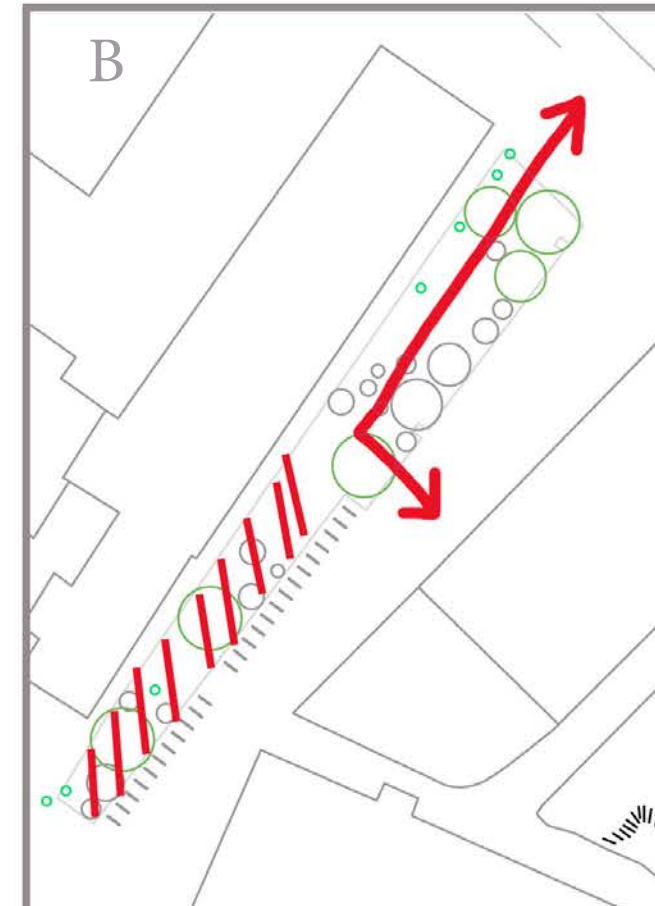
choice of path :
big natural stones.
In between them
plants (for example
thyme) will grow. this
choice of material
ensures a 'clean' , ap-
proachable look of the
foodforest, even when
the plants grow wild
and lush. This is im-
portant, to make sure
we can keep people
behind the project of
the foodforest.



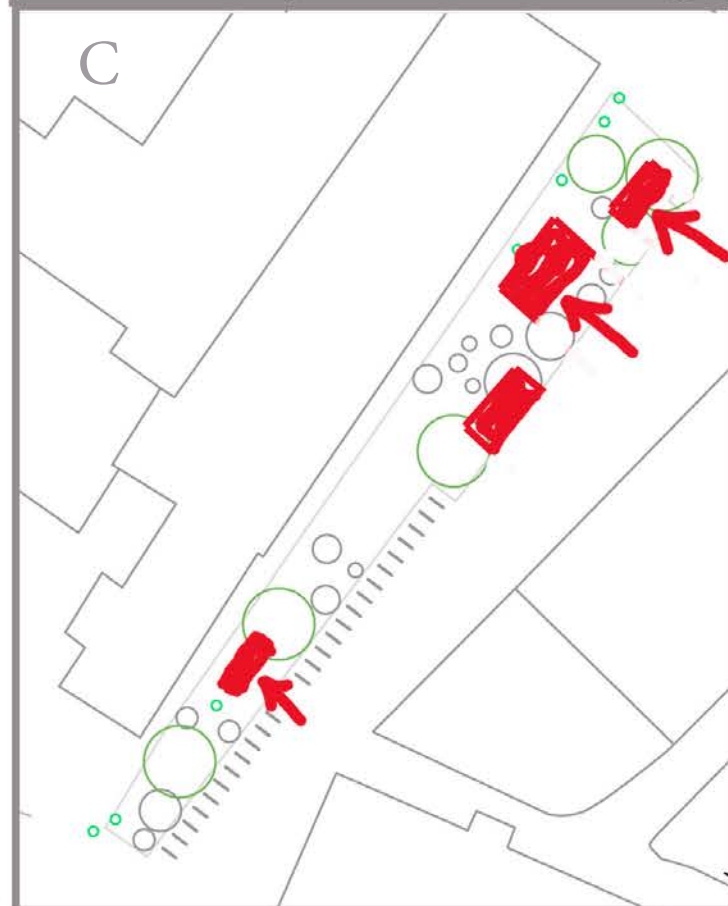
walking between and
close to the trees and
shrubs can compact
the ground in the long
term; therefore it is
asked of visitors to
enjoy from the path.



classic path
that flows
through the
foodforest

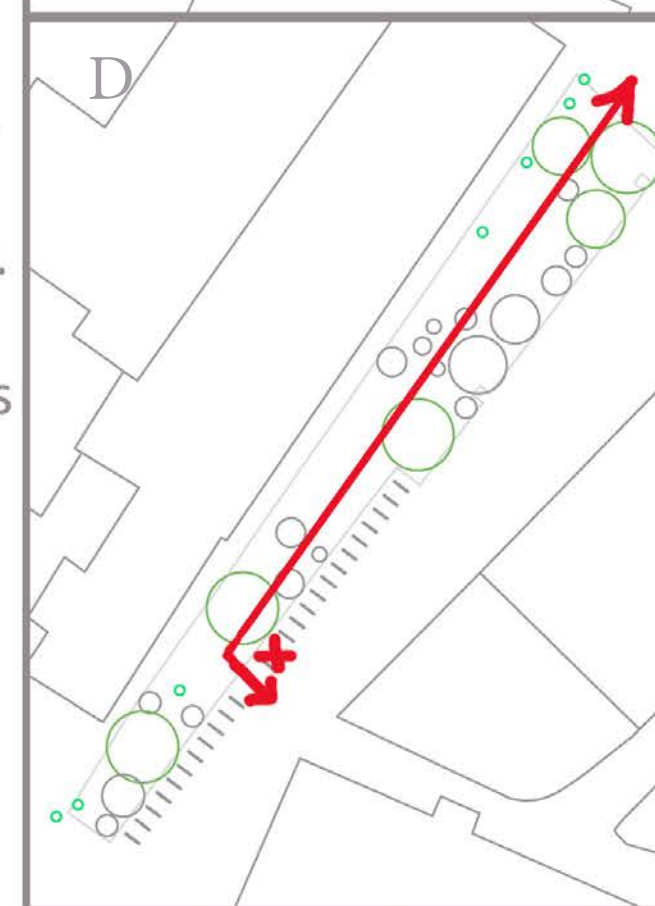


part of the foodforest is
ONLY for animals and
plants. this way it
is easier to create a
well-functioning
mini-ecosystem.



no continuing path
but rather modules.
people are 'sucked
into' the foodforest.

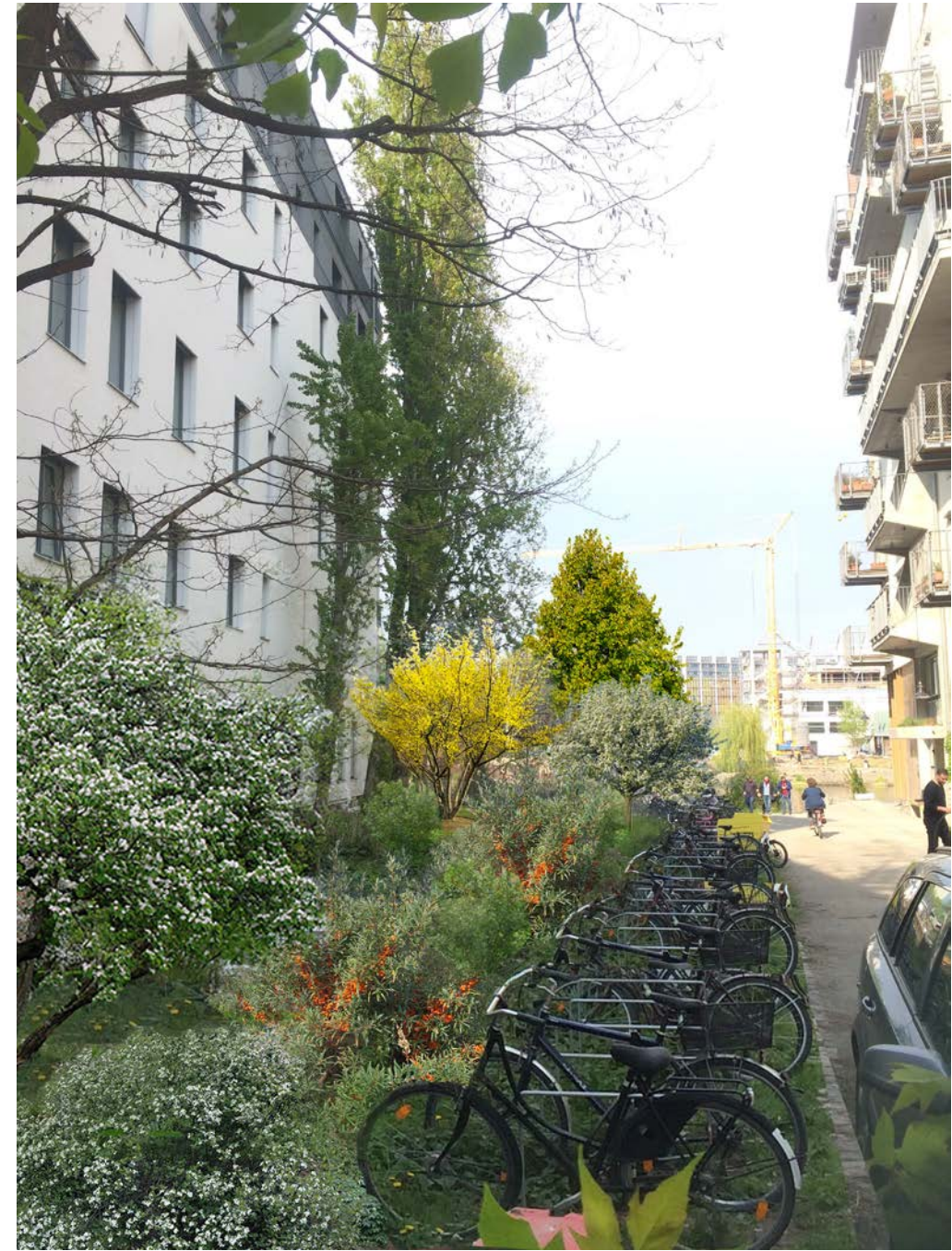
some of these zones
are under
the canopy,
other zones are in
open areas.



1 or 2 bicycle racks are
removed, next to the lantern,
and an entrance
to the foodforest is created.
this way there is a 'surprise'
effect. when one passed
by the bicycle racks,
all of a sudden there is a
secret, unexpected path.



site anno 2017



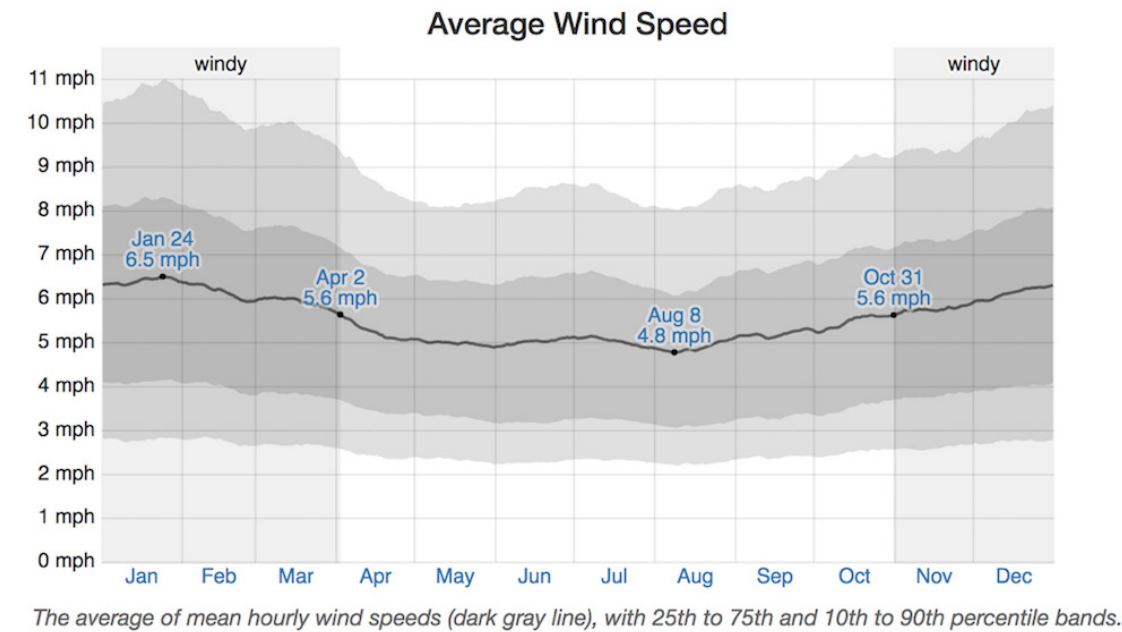
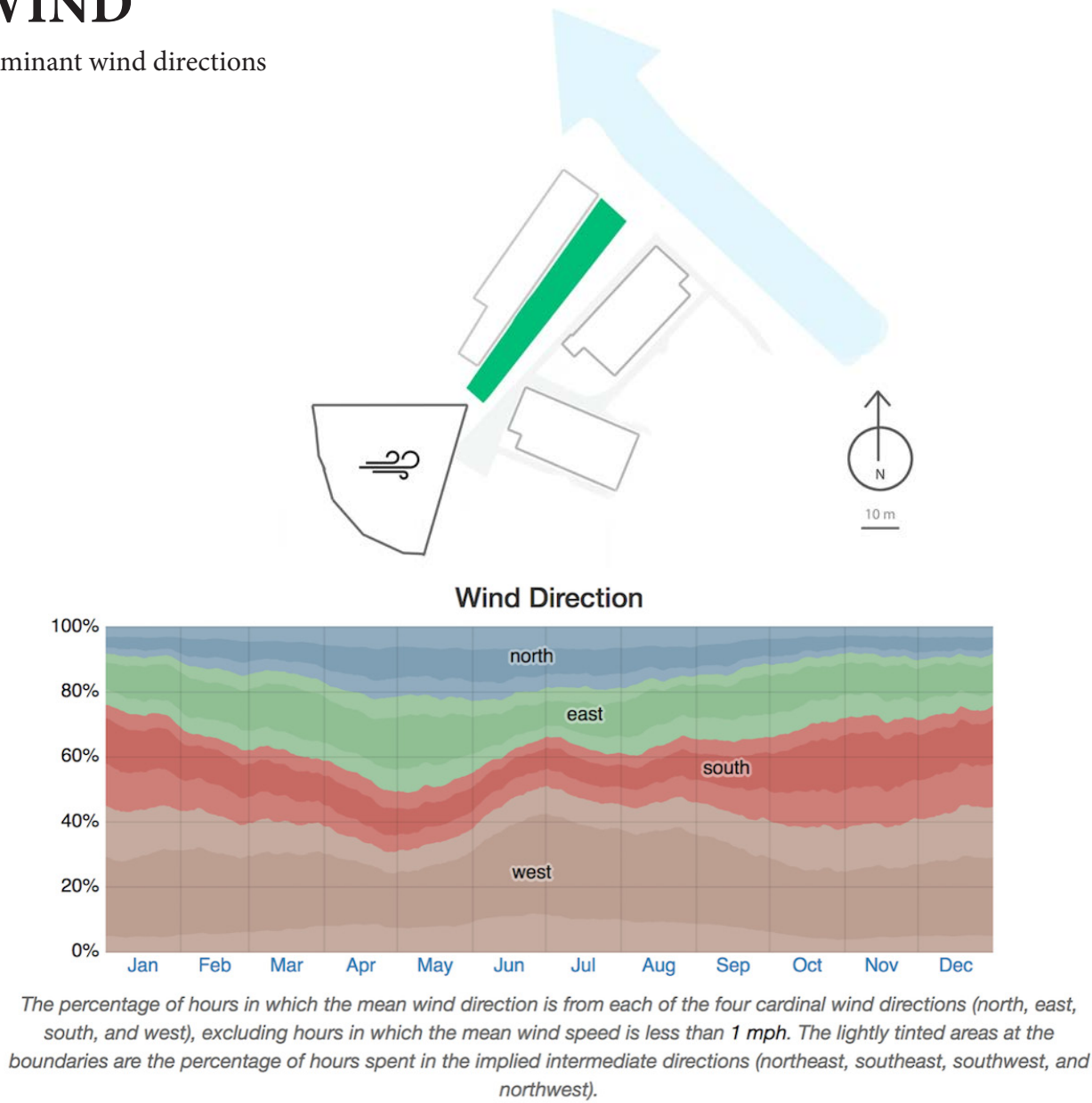
future foodforest in full bloom :
impression of the chosen tree & shrub - species

ANALYSIS SITE

- WIND
- SPREE
- SOIL
- SUN
- SWOT
- TREES
- GEBIETSEIGEN PFLANZEN
- INFLUENCE POPULUS ON SITE

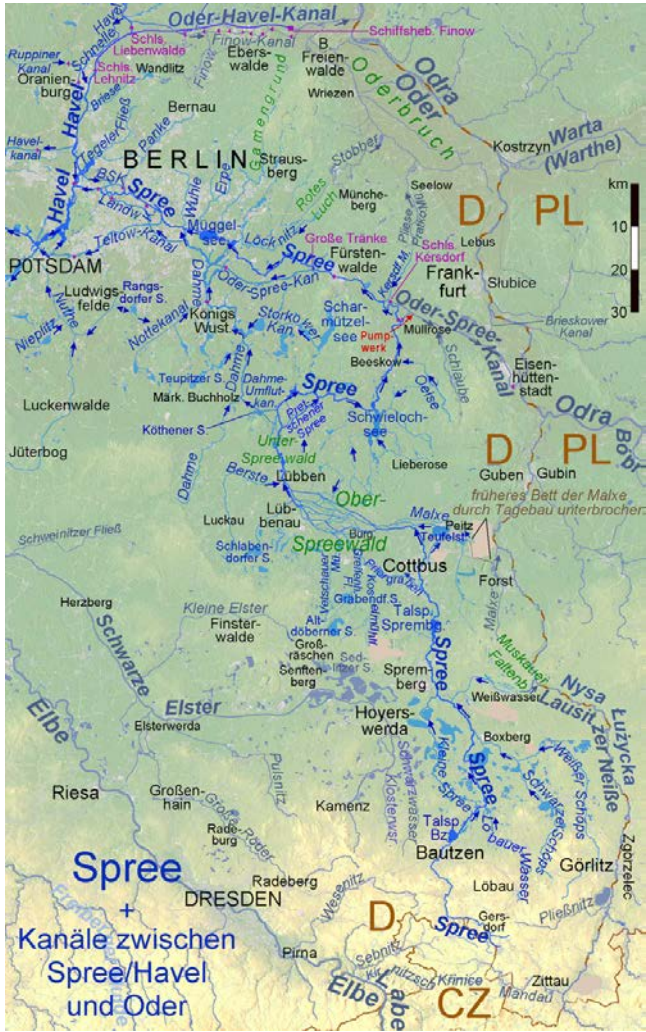
WIND

dominant wind directions



The predominant average hourly wind direction in Berlin is from the west throughout the year.

SPREE



Next to the project site of the Foodforest flows the Spree. The idyllic view on the Spree river takes the location of the food forest to a higher level visually. Ecologically, the polluted Spree has a long way to go. Because everything is interconnected, greening riverbanks and cleaning up contaminated soils also has a positive impact on nearby streams and rivers.

“Kein Fluss ist so intensiv mit Berlin verbunden wie die Spree. Berlin ist an der Spree entstanden und wird von ihr geprägt. Die Spree ist im Laufe der Geschichte zum Teil massiv an die Bedürfnisse der Stadt angepasst worden. Seit den 90er Jahren wenden sich die Menschen dem Fluss wieder intensiver zu. Am Ufer der Spree gelegene ehemalige Industrie- und Gewerbestandorte werden zu Wohnorten umgenutzt, Brachen werden zur Strandbar. Die Spree hat Entwicklungspotentiale – städtebauliche und auch ökologische.” “The water quality of the Spree, which runs through downtown Berlin and Saxony and Brandenburg states in eastern Germany, has been tainted by rising iron and sulfate levels.” “The increase in the sulphate load in the spreading system is of paramount importance for Berlin because it can present enormous challenges for the city’s drinking water supply. Up to 70% of our drinking water production is won from bank filtrate - ie from wells in the immediate vicinity of lakes and rivers. Therefore, the drinking water supply in the Greater Berlin region is closely linked to the substance of the river Spree. The discharges of the active mining industry in the Lausitz cause about 65% of the sulfate entries into the Spree.”

(source : <http://www.stadtentwicklung.berlin.de/umwelt/wasser/eg-wrrl/de/inberlin/spree.shtml>)

In the regional standard, the wind conditions in Berlin are determined through the situation in the transition between continental and more oceanic climate. Certainly the west - to northwest winds correspond to the oceanic component with mainly less polluted sea air. The east - to southeast winds correspond to the continental component with lower wind speeds and above all the higher pollutant concentration in the winter (cf. Fig. 2 and Fig. 3). Within the city boundaries however, small scale elements, like temperature - and pressure differences between different city structures also influence the wind currents.

The distribution of the wind directions for the Berlin region is representative for both day - as well as night hours (cf. Fig. 2). The most frequent wind direction is west with 21 % of all hours, followed by southwest with 16 %. At both wind directions wind speeds > 4 m/s appear with the most frequency. North and north east are represented as wind directions of least frequency. The mean wind speed (averaged over the year) is greatest (cf. Fig. 3) at the most frequent wind directions (west and southwest). Winds from the southeast display, on average, the lowest wind speeds. The annual course of the wind speed has its maximum in the winter and its minimum in the summer months.

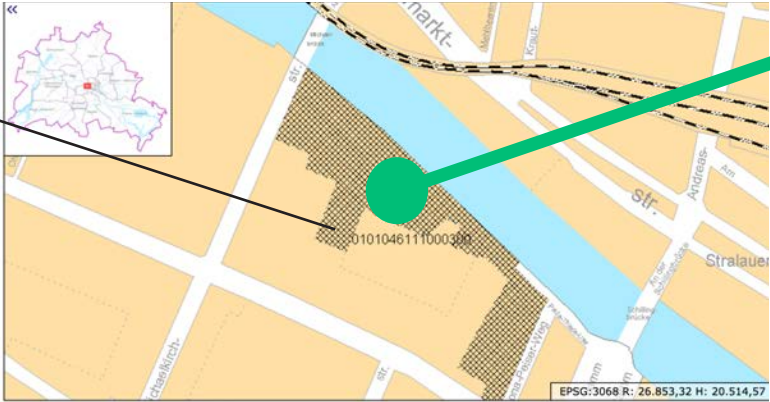
sources : http://www.stadtentwicklung.berlin.de/umwelt/umweltatlas/ed403_02.htm Prevailing Wind Direction in Summer : W , Associated wind speed : 8, http://web.utk.edu/~archinfo/EcoDesign/escriculum/CLIMATEDATA/ES_CITYDATA/GERBerlinClim.html, <https://weatherspark.com/y/75981/Average-Weather-in-Berlin-Germany>

SOIL

1. analysis / MACRO

RESEARCHED TOPIC	
- biotope value	small
evaluation archival function for natural history	low
soil association	loose lithosols + regosol + calcaric regosol
on/made of	inner city, on aggregated surfaces
parent material	construction debris and war debris
level/ evaluation binding power for heavy metals	high
evaluation nutrient-storage capacity	low
type of soil of the coarse Topsoil	medium proportion of sharp stones
type of soil of the coarse Subsoil	medium proportion of sharp stones
typical PH-value (CaCl2) of the topsoil (0-10 cm)	7 (lowest 5 highest 8)
typical PH-value (CaCl2) of the subsoil (90-100 cm)	7,5 (lowest 6 highest 8)
level of typical pH-value (CaCl2) of the topsoil	very weakly alkaline
Humus content of the (mineral) Topsoil (Mass-%)	3
- Near-Natural Quality of the soil 2010	extremely strongly changed
evaluation near-natural quality	very low
- yield function of the soil for cultivated plants	↓
evaluation yield function for cultivated plants	low
evaluation water supply	bad
mean nFK-Value of the flate root zone (mm)	30
lowest nFK value of the Flate Root zone (mm)	10
highest nFK value of the Flate Root zone (mm)	80
depth to groundwater (m)	3,1
evaluation nutrient supply of the topsoil	poor
typical PH-value (CaCl2) for the topsoil (0-10 cm)	7
- water permeability of the soil	↓
Kf Topsoil (cm/d)	427
Kf Topsoil (cm/d)	427
level Kf Surface-and topsoil	extremely high
main type of soil of the Topsoil	mS (medium sand)
minor components of Topsoil	fS (fine sand) , SI3 (medium loamy sand)
main type of soil of the Subsoil	mS (medium sand)
minor components of Subsoil	fS, (fine sand) , SI3 (medium loamy sand)

Loose lithosol (raw soil of loose material) + regosol + calcaric regosol (para-rendzina) (inner city on aggradation/landfill)
This soil association describes soils of the previously densely constructed inner city, completely destroyed in Second World War. Most war debris remained where it fell. Many surfaces without buildings have a soil layer composed partially or completely of war debris. This thickness of this layer is from a few tenths of a meter up to 2 meters deep (cf. Grenzius 1987).These surfaces develop lithosols and calcaric regosols. Surfaces without war debris develop lithosols and regosols.
- Die Bodentypen werden in Klassen unterteilt: Auenböden (A), Braunerden (B), Gleye (G), Moore (H), subhydrische Böden (J), Lessives (L), terrestrische Rohböden (O), Podsole (P), Ah-C-Böden außer Schwarzerden (R), Pseudogleye (S), Reduktosole (U), zweifache Bodenentwicklung mit Überlagerung (X) und terrestrische anthropogene Böden (Y).
source : Senate department for urban develompent and environment - Berlin.



Soil Type according to KA4	OLn (Lockersyrosem (Normtyp),bodentypenklasse O) , RQn (Regosol (Normtyp) , btk R), RZn (Pararendzina (Normtyp) btk R)
evaluation filtration capacities	low
- water balance	↓
-usable field capacity (for plants with short roots) (vol %)	10
-usable field capacity (for plants with long roots) (vol %)	12
- utilizable capillary capacity of the soil of flate root plants 2010	↓
mean nFK-Value of the flate root zone (mm)	30
level of nFK of the flate root zone	low
mean nFK-Value of the deep root zone (mm)	180
capillary capacity 0-20 dm (mm)	232
capillary capacity Topsoil (mm/dm)	15
capillary capacity Subsoil (mm/dm)	11
-percolation (mm/a)	170,3
evaluation regulatory function for the water balance	low
level exchange frequency of the groundwater	high
exchange frequency of the groundwater (/ year)	3,87
percolation (mm/a)	170,3
-organic matter content of the soil	↓
organic matter content (kg/m2)	4,7
level organic matter	very low
evaluation nutrient supply, topsoil	poor

2. analysis / MICRO results site-analysis

Boden / Grundwasser done by Dipl. Geol. Torsten Huntemann 2011

MKW = Mineralölkohlenwasserstoffe = petroleum-derived hydrocarbon
PAK = PAH (English) : Polycyclic aromatic hydrocarbons

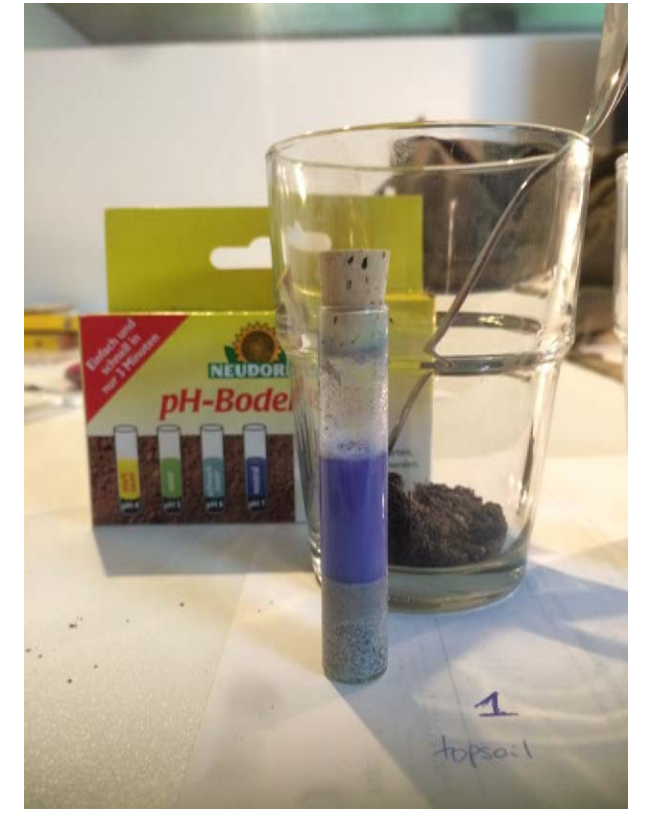
Boden / Bewertung

“Die Ergebnisse der Nachuntersuchungen des Bodens im Bereich der GWM 7/11 belegen eine Bodenbelastung im grundwassergesättigten Bereich mit MKW und PAK, die als Quelle für eine Grundwasserbelastung zu sehen ist. Durch die im Umfeld der GWM 7/11 niedergebrachten Bohrungen mit entsprechenden analytischen Untersuchungen konnte die Belastung visuell und analytisch räumlich eingegrenzt werden.
Entsprechend der vorliegenden Analysen sind die Bohrungen 7, 7.1 und 7.2 deutlich mit MKW belastet. Der in der 7.2 festgestellte Geruch nach Schweröl bestätigt sich analytisch mit einem sehr hohen PAK-Gehalt. Nach außen hin sind deutlich abnehmende MKW-Konzentrationen zu verzeichnen, die an der Sondierung 7.4 den Beurteilungswert der Berliner Liste noch tangiert.
In der flächigen Ausdehnung ist ein Bereich von ca. 7 x 5 m als belastet zu betrachten, der Beginn der Belastung in die Tiefe liegt min. bei etwa 1,4 m u . GOK und reicht bis 2,0 und 3,5 m u. GOK. Bei einer mittleren Mächtigkeit der Belastung von ca. 1,4 m ist bei einer Gesamtkubatur der Baugrube von ca. 100 m3 mit ca. 50 m3 entsprechend 90 t belasteten Bodenmaterials zu rechnen. Vergesellschaftet mit den MKW finden sich in diesem Bereich hohe Konzentrationen an PAK.” (Torsten Huntemann, Analyse 2011, Berlin)

Grundwasser / Bewertung

“Im Ergebnis der Grundwasseruntersuchungen aus den drei Monitoringkampagnen wurden je nach Grundwasserverhältnissen sehr stark wechselnde Schwermetallkonzentrationen festgestellt. Die beiden Messung zu Zeiten eines Spreemittelwasserstandes zeigen deutliche Belastungen im Abstrom des Untersuchungsgeländes. Der Anstrom des Geländes zeigt in den Messstellen GWM 6/11 und 8/11 keine entsprechenden Konzentrationen, so dass von einem Eintrag vom untersuchten Gelände auszugehen ist. Im Rahmen der Bodenuntersuchungen wurden Schwermetalle im östlichen Grundstückbereich festgestellt, die sich in der Belastung des Grundwassers der GWM 4 sowie im Abstrom (GWM 3/11 und GWM 7/11) zeigen.
Aufgrund der Standortgegebenheiten ist eine Gefährdung der Schutzgüter Grund- und Oberflächenwasser aus gutachterlicher Sicht derzeit nicht auszuschließen. Eine Beeinträchtigung der Grundwasserqualität, ausgehend vom untersuchten Grundstück ist belegt. Es besteht weiterer Handlungsbedarf.” (Torsten Huntemann, Analyse 2011, Berlin)

The whole document about the analysis is interesting. This is a summary document , so I would advice to analyse all the tabels for yourself. Further soil-analysis in coöperation with an extern institute (for example Humboldt University) could be a win-win situation : students can analyse a very interesting place, and work out an example of how to upgrade soils as there are many in Berlin. From our perspective, we can help making an example of urban landscape architecture. We can set an example. We can show : with enough knowledge, time and know-how one can transform any urban place into a healthy oasis with eadible plants and trees again. However, this is a process in which the rhythm of nature must be respected. Furthermore - the soil is quite sandy at our location. Sandy soils make the establishment of some trees and plants more difficult and intensive in maintenance, although a mixture of sand and high humus content will provide fertile conditions for many plant species. The ideal soil for most kinds of edible species = deep, well drained loam, slightly acid at about pH 6,5-6,7 (Whitefield, 2002) generally we can state that the plant growth will depend on the degree that the available soil differs from this ideal.



Pictures of the projectsite. Own tests (PH & percolation) & visuals confirm the results of the macro-analysis when it comes to waterinfiltration and debris. I did a waterinfiltration-test : some parts of the topsoil are compacted - the cause might be heavy machinery during the construction of the nearby housing complex. the subsoil on the other hand had a very high waterinfiltration. This confirms the results of the macro-analysis.

Important background-research when interpreting the results

“The number of available experimental data on plant uptake of contaminants increases. Often, model concepts and measurements are in good agreement, but we may also encounter surprises. Plants are living organisms, and the uptake processes are complex and variable. Uncertainties in the model predictions are high, and large variations may be expected in predicted, but also in experimental data, due to the variations of contaminant-specific, plant physiological and environmental parameters as described in this chapter. “ (*Uptake of Organic Contaminants from Soil into Vegetables and Fruits Stefan Trapp and Charlotte N. Legind - <https://homepage.env.dtu.dk/stt/PhD%20course%202013website/Day2/Chapter%209%20Legind%20and%20Trapp.pdf>*)

‘Ground water and surface water are interconnected and can be fully understood and intelligently managed only when that fact is acknowledged.’ (“Getting Up to Speed” for section C, “Ground Water Contamination” is adapted from US EPA Seminar Publication. Wellhead Protection: A Guide for Small Communities. Chapter 3. EPA/625/R-93/002.)

“May children eat vegetables, fruits and berries from the garden? Yes, but only those grown in uncontaminated soil. If you have old fruit trees and berry bushes, you ought to avoid that children eat these fruits and berries.” (*Programme for Nutrition Policy, Infant Feeding and Food Security World Health Organization Regional Office for Europe Scherfigsvej 8, 2100 Copenhagen-Denmark*)

“Heavy metal accumulation in soils and plants is of increasing concern because of the potential human health risks. This food chain contamination is one of the important pathways for the entry of these toxic pollutants into the human body. Heavy metal accumulation in plants depends upon plant species, and the efficiency of different plants in absorbing metals is evaluated by either plant uptake or soil-to-plant transfer factors of the metals” (Rattan et al., 2005).

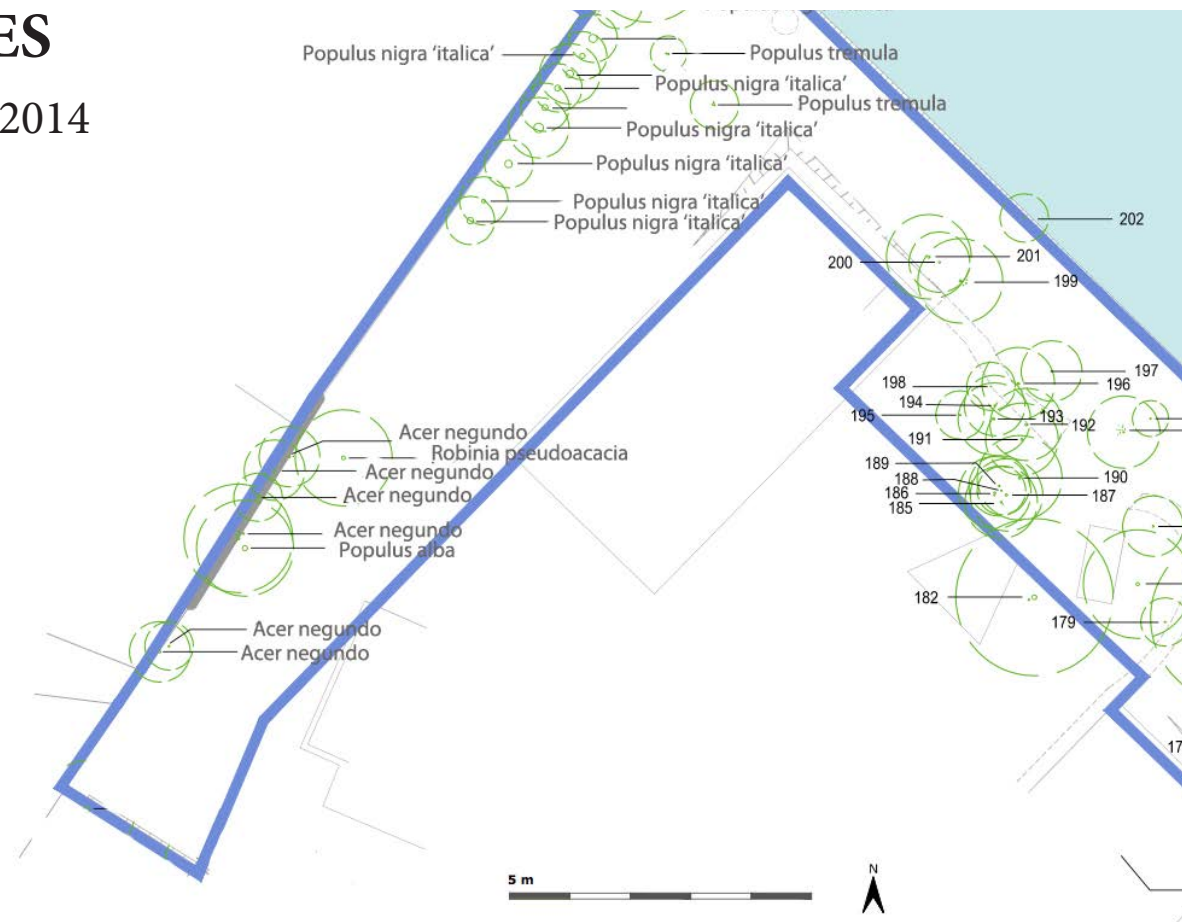
‘With heavy rainfall or irrigation, the groundwater table rises. It may even reach and saturate the rootzone.’ ‘In fine textured soil (clay), the upward movement of water is slow but covers a long distance. On the other hand, in coarse textured soil (sand), the upward movement of the water is quick but covers only a short distance.’ (*Food & agriculture organisation of the united nations-corporate document repository*)

‘The heavy metal (HM, also referred to in scientific literature as metal[oid]) contamination of soil is one of the most pressing concerns in the debate about food security and food safety in Europe (CEC, 2006a) and globally (Kong, 2014). A recent review by Peralta-Videa et al. (2009) summarizes the impact of heavy metal from food origin on human health as well as the mechanism of uptake, transformation and bioaccumulation of heavy metals by plants. The number of contaminated sites in the European Union (van Liedekerke et al., 2014) and the area affected by different kinds of pollution, of which the remediation would cost €17.3 billion annually (CEC, 2006b) underlines the extent of the problem in the continent. Apart from soil contamination which may lead to the degradation of water quality and a series of negative impacts on the environment (Mulligan et al., 2001 ; Rattan et al., 2005), the propagation of heavy metals throughout the food chain have serious consequences for human health (Järup, 2003).’

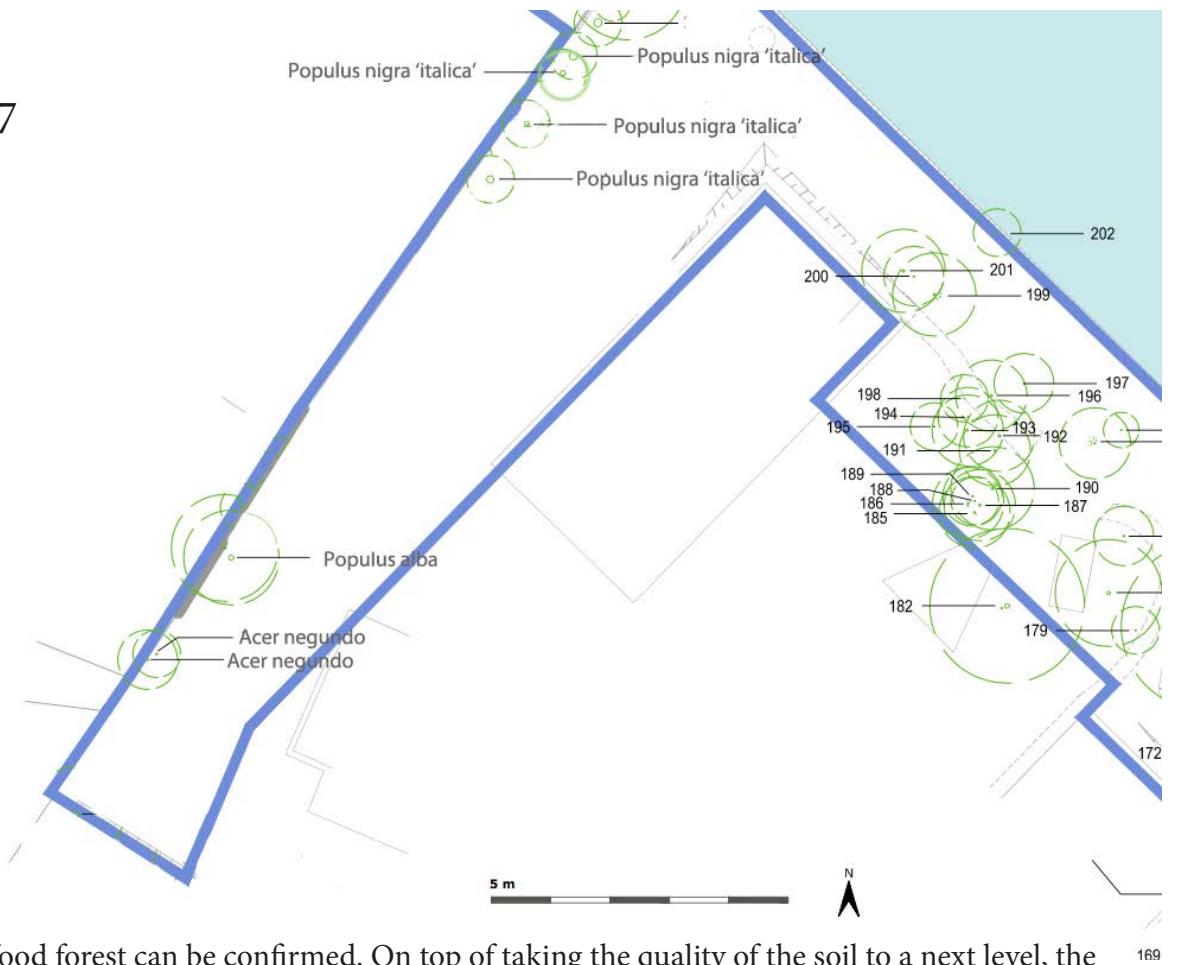
In Spreefeld the groundwater is pumped up to spray the plants. Given the extreme results of the groundwater-analysis, this is far from ideal. “Certain vegetables take up heavy metals from contaminated water used for irrigation, a new study finds. The researchers suggest that food control authorities should assess levels of heavy metals in crops and that farmers should use clean water for irrigation in order to reduce the levels of heavy metals entering the food chain.” (“Science for Environment Policy”: European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol)

TREES

2014



2017



based on a plan by Gruppe F

It has yet to be decided which trees still present in the foodforest will stay or go. After some research the benefits of Populus trees in our food forest can be confirmed. On top of taking the quality of the soil to a next level, the trees provide organic matter for the food forest. This is of high importance. For this reason, I have no preference for cutting away the Populus trees. The trees on the south side (the *Acer negundo* & *Populus alba*) also have a function - they serve as windbreakers and could keep functioning like this in the future. (The main direction where the wind comes from is southwest-west)

“As one of the most often used tree species in phytoremediation, poplar play significant role in remediation of contaminated sites. Their advantages refer to high biomass production and rapid growth, easily vegetative propagation, high transpiration rate and dependence upon the groundwater levels. Poplars are well known as early successional tree species that inhabits new formed alluvial soils. During their growth the “connection” with groundwater maintains constant due to plasticity of their roots.” “Some greenhouse and field researches showed potential of poplars for phytoextraction of some heavy metals such as As, Cd, Ni and Zn.” (International Poplar Commission - Investigating potential of some poplar (*Populus* sp.) clones for phytoremediation of nitrates through biomass production)

“Plantations with poplar hybrids can help to solve these environmental problems” (Zsuffa et al. 1996, Guerra et al. 2010)

“Species belonging to genus *Populus* (poplars) are suitable candidates for phytoremediation. These trees have a high biomass production, extensive roots, high rates of transpiration and easy propagation. Also, the wide genetic diversity comprised within genus and the development of multiple biotechnologies and information resources allow a genetic improvement based on traditional and biotechnological approaches. Studies carried out in different experimental conditions show that poplars exposed to Cu, Cd and Zn exhibit distinct tolerance levels and metal accumulation patterns.” (Phytoremediation of heavy metals using poplars (*Populus* Spp.): A glimpse of the plant responses to Copper, Cadmium and Zinc stress. (PDF Download Available). Available from: https://www.researchgate.net/publication/230059005_Phytoremediation_of_heavy_metals_using_poplars_Populus_Spp_A_glimpse_of_the_plant_responses_to_Copper_Cadmium_and_Zinc_stress [accessed May 30, 2017].)

“The European black poplar (*Populus nigra* L.) is a native European tree species, which forms floodplain forests along riversides in riparian ecosystems. This pioneer species plays a central role in the initial phase of the development of riparian forests contributing to the natural control of flooding and water quality, and serving as a natural corridor that facilitates gene flow for many riparian species. It sustains viability, stability and specificity of ecosystems along river flow. Once widespread, and now considered threatened, *P. nigra* deserves special attention in terms of conservation.” (Variability of European Black Poplar (*Populus nigra* L.) in the Danube Basin, http://www.danubeparks.org/files/1903_BlackPoplarMonography.pdf)

Trees such as poplars and willows are used for hydraulic control or to clean up deeper soil contamination and contaminated groundwater. Plants used for phytoremediation can make a site more attractive.

Example : Phytoremediation is being used to clean up contaminated groundwater near a former disposal area at the Aberdeen Proving Ground in Maryland. This area was used for disposal and burning of industrial and warfare chemicals from 1940 through the 1970s. Chemicals used as industrial degreasers and solvents were found to be a particular problem in the groundwater. In the spring of 1996, 183 poplar trees were planted in a one-acre area. The trees draw in contaminated groundwater and break down contaminants in the root zone. The groundwater levels near the trees show that they are keeping the plume of contaminants from moving to clean areas. EPA estimates that within 30 years of the start of cleanup, the contaminants in groundwater at the site may be reduced by up to 85 percent. (source : US EPA)

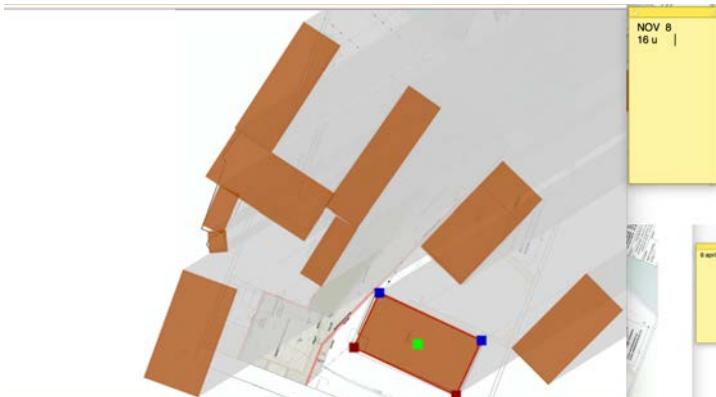
GEBIETSEIGEN PFLANZEN

Due to the multiple benefits of including native plants in the design, the analysis included discovering local plants in Berlin. These are incorporated in the design.

(source: Senatsverwaltung für Stadtentwicklung) - Plants that are **native** to a particular region over millennia tend to build a rich ecological association with birds, animals, insects and all small life forms. (Sholto Douglas & Hart, 1985) These bounds are far richer than those of exotic species, even if they were introduced centuries ago. Therefore the presence of old native plant species in the forest, whether natural or man-made, are of greatest value for the biological stability and prosperity of the food forest ecosystem.









BASICS FOODFOREST-MANAGEMENT

- If all goes well the **productive stage** will be obtained after 3-5 years. (Wouter Van Eck, 2014)

- We won't intervene too much but we'll speed up **natural succession** : we'll stimulate the building of fertile soil by adding nitrogen-fixing plants.

- Working for a constant increase of **organic matter content in the soil** will improve any bad soil conditions in the long run. Therefore an establishment of sufficient canopy tree layer is an essential part of the food forest as it delivers annual free organic material. Establishing the highly productive canopy layer is a guarantee of sufficient organic matter and therefore high humus content, naturally produced on site in the food forest. Therefore the need of external delivery of organic matter in the form of compost is not necessary in a well-established food forest ecosystem.

- Any **disturbance** to the process of humification will lead to potential disorder in the whole forest ecosystem (Rusanov. et al, 2009) therefore humus formation plays a very important role in the productive and healthy forest and food forest ecosystems. The forest soils are annually fed with a considerable amount of organic matter, produced by the aboveground vegetation.

- Humus formation any disturbance to the process of humification will lead to potential disorder in the whole forest ecosystem (Rusanov. et al, 2009) therefore humus formation plays a very important role in the productive and healthy forest and food forest ecosystems. The forest soils are annually fed with a considerable amount of organic matter, produced by the aboveground vegetation.

- The **support of soil fertility** is the task of every food forester. How ? Not to weed, plough, use any fertilizers, but instead to plant sufficient nitrogen-fixing and mineral-accumulating plants and avoid stepping beyond the paths in the food forest too often so as to keep the compaction of the soil to a minimum.

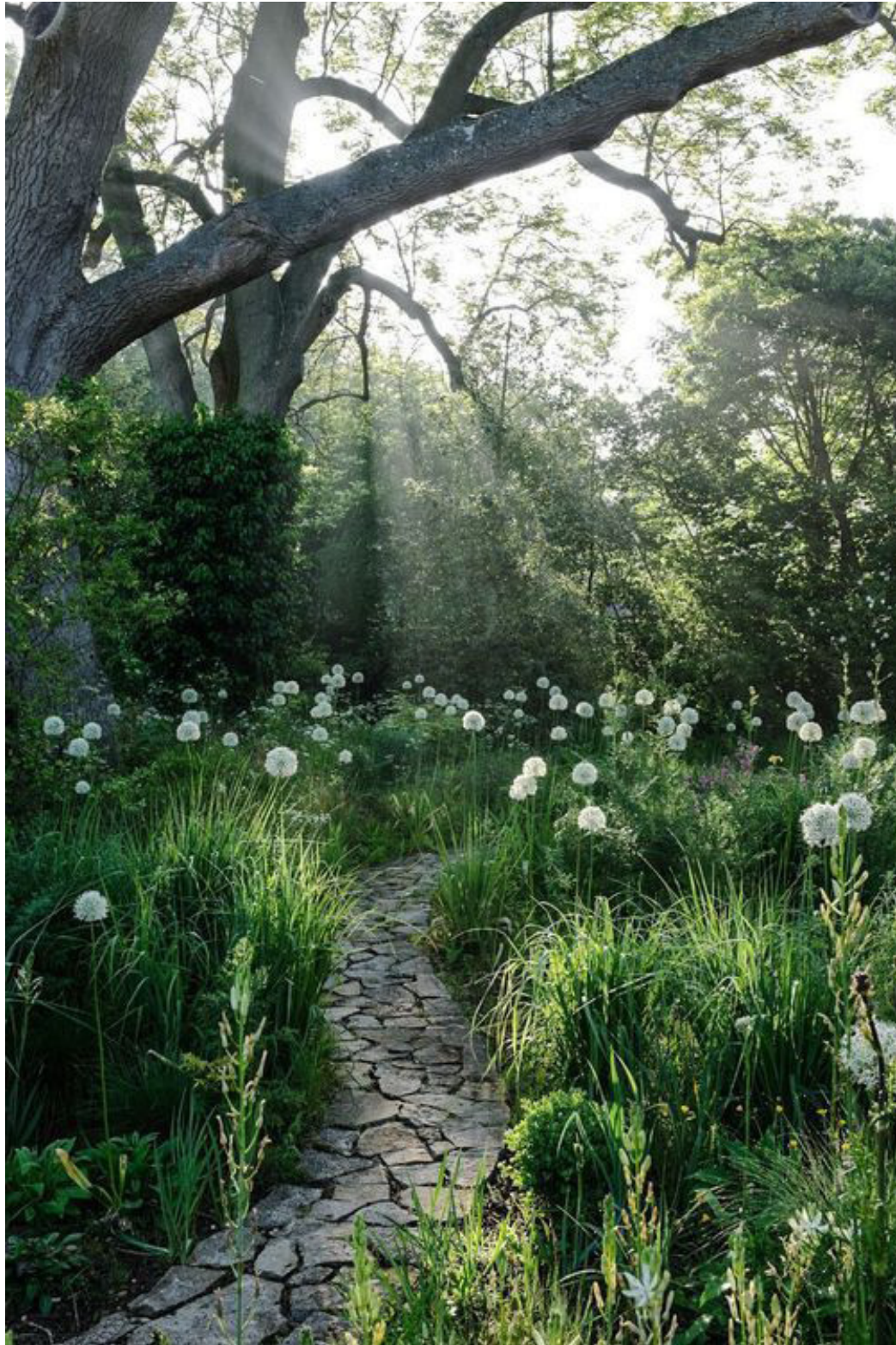
- You can see how the natural balance develops itself if you do not do too much (due to natural stabilization) Any unexpected plague in the first years of our food forest should not make us lose faith in our 'natural' way of thinking. Such events are just indicating that the ecosystem is in a state of imbalance and it will need time to find a natural equilibrium.

- These **systems of nitrogen fixation** are very efficient in recycling nitrogen leached to lower depths in the soil through uptake by deep roots and recycling of leaf fall. By this means, nitrogen becomes concentrated in the litter and upper soil horizons. Disturbing this natural cycle, which conserves scarce nutrients so effectively, can lead to rapid loss of soil fertility. Therefore maintenance of the soil mulch is a very important aspect of maintaining soil fertility around trees and shrubs in natural and food forest ecosystems “

-A **small plot** available for a food forest might not be sufficient for some animals to create a stable population that can resist plagues.

- In the beginning of the establishment of a food forest system, there will for sure be some **weeds** coming up, especially if the ground was disturbed. The art, is not to worry too much about it, and do not make energy-intense actions to “defeat” all of such weeds. You can make a lot of mistakes very quickly. The food forest ecosystem needs to develop and establish itself, and weeds are part of Nature's recovery plan. Social aspects are at the same time also very important within the holistic ecosystem management. Wouter van Eck (Eck, 2014):”So if your neighbours will be not happy with the appearance of weeds that can presumably seed themselves on their fields, be prepared to cut them locally. (V. Eyk, 2014)

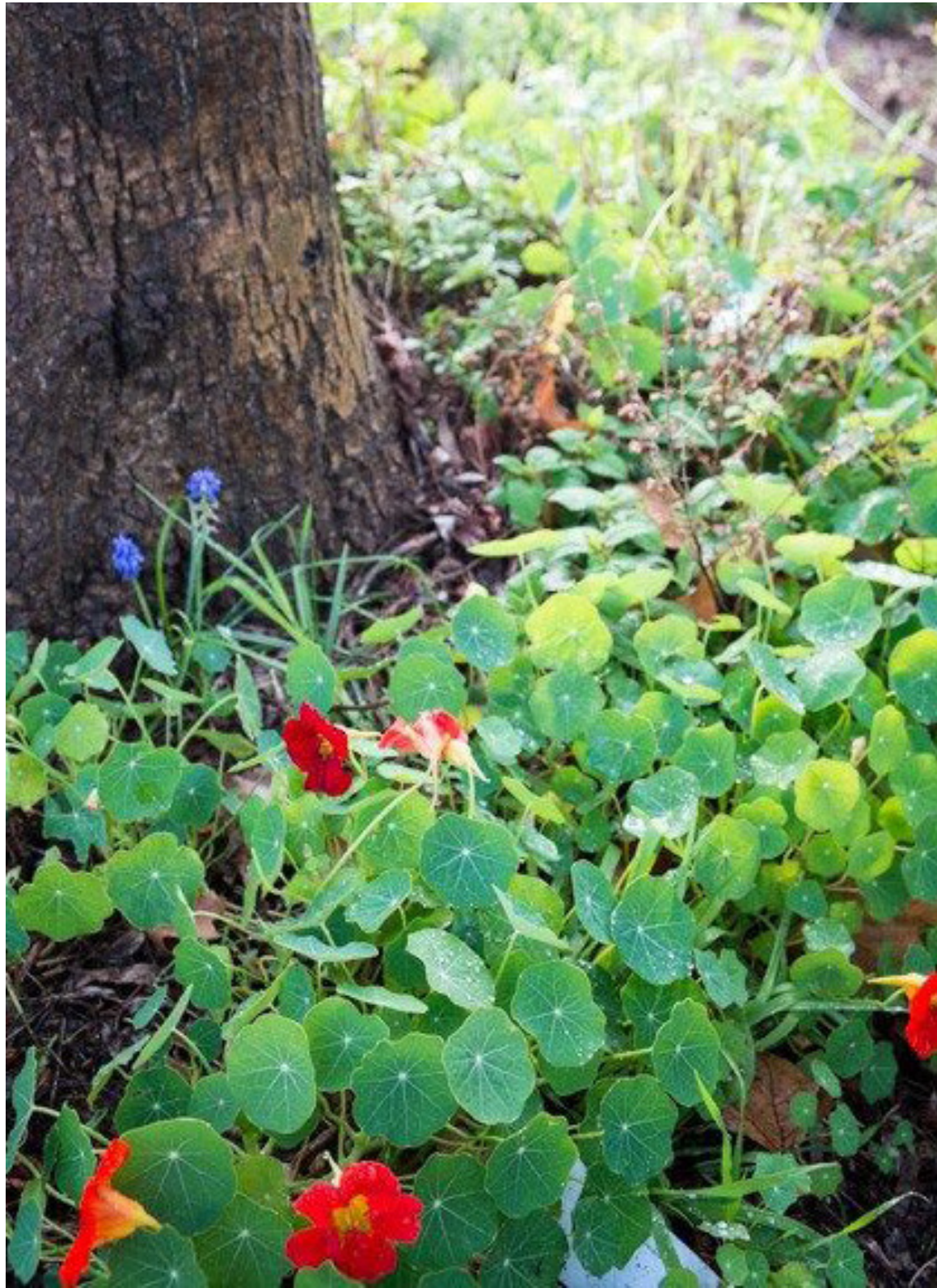
MOODBOARD FOODFOREST



a small, green oasis in between buildings



big natural stones.



The activities common in conventional and even biological gardens can be destructive to a wide range of forest plants. What we need to realize, is that in natural forests there is nobody that weeds out “non- useful plants” and the soil is covered with a great amount of organic matter. (Wouter Van Eck, 2014)



trying to bring some magic into the city..

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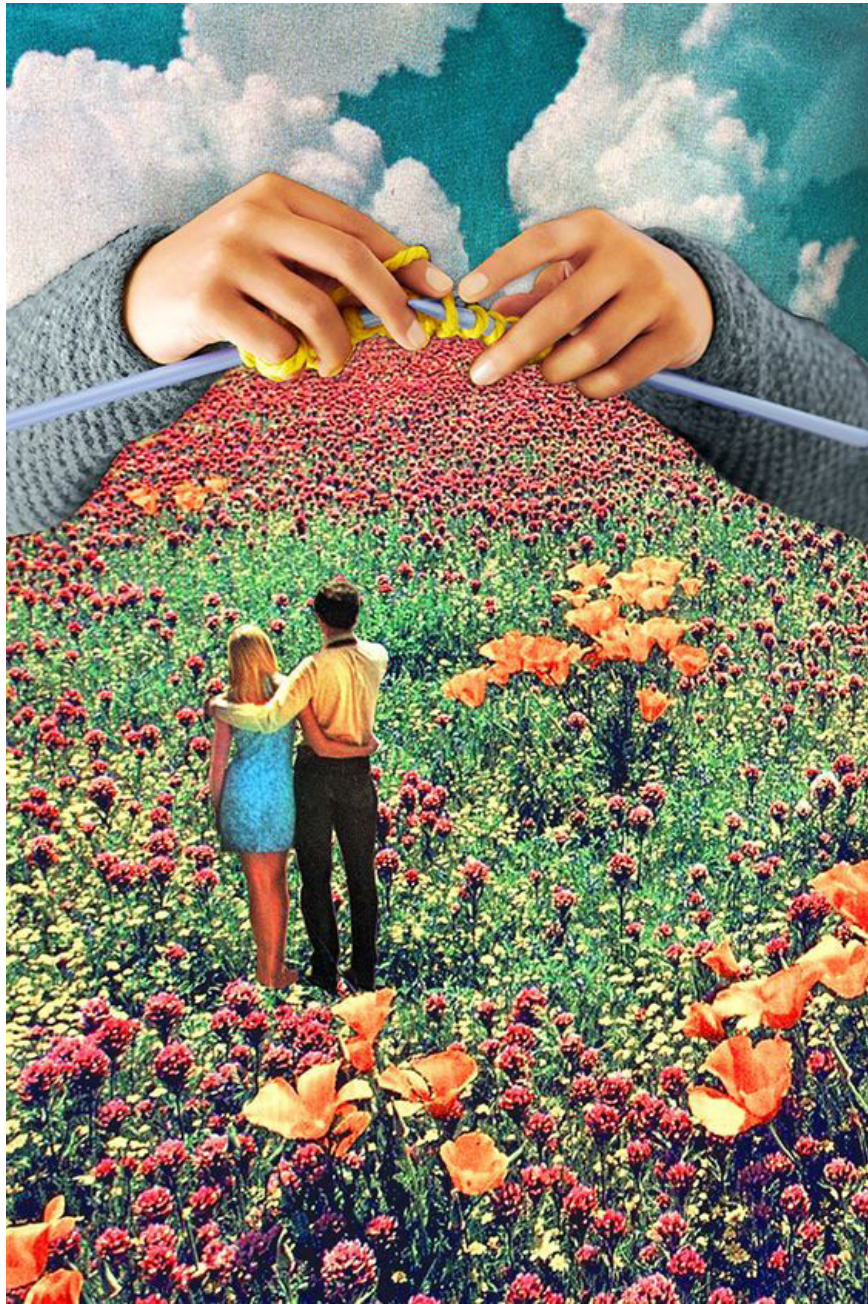
World Health Organization

(Rusanov. et al, 2009)

SCU, The University of the West of England, Bristol

MICHAEL :)

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